Injury Extra 41 (2010) 17–19

Contents lists available at ScienceDirect

Injury Extra

journal homepage: www.elsevier.com/locate/inext

Case report

Extravasation of contrast material in anterior chest wall: Case report and literature review

Avi S. Galler [a,*], Mary Lou Patton [b,1]

[a] Christiana Care Health System, Department of Surgery, MAP II, Suite 2121, 4745 Ogletown-Stanton Road, Newark, DE 19713, United States
[b] Crozer-Chester Medical Center, One Medical Center Boulevard, Suite 130, Upland, PA 19013, United States

ARTICLE INFO

Article history:
Accepted 1 November 2009

1. Introduction

The use of iodinated contrast material has become the standard for radiographic imaging, but extravasation into subcutaneous tissue is a well-recognized complication that is not without risk. The overwhelming majority of extravasations can be treated conservatively, but rarely severe skin necrosis, brachial plexopathy, or even compartment syndrome will require more invasive treatment. Though the most common extravasation site occurs at the antecubital fossa, this complication can occur at any location.[21] We present a case of a patient with extravasation of iodinated contrast medium into the right anterior chest wall from a dislodged central venous catheter treated with emergent washout and negative pressure dressing (VAC™).

2. Case report

A 20-year-old male was admitted to the burn intensive care unit after an apartment fire. His injuries involved a total body surface area (TBSA) of 3.5% with partial thickness burns to his fingertips and right flank. He had significant inhalational injury requiring intubation. A right subclavian triple lumen central venous catheter was placed on the day of admission with the catheter tip identified at the superior vena caval/right atrial junction. A computed tomography (CT) scan of the sinuses and chest were ordered revealing pansinusitis and bilateral lung consolidations. The scan also displayed extravasated contrast in the right peri-clavicular soft tissue (Fig. 1).

Approximately 80 mL of Omnipaque-300™ was injected through Medrad Envision™ rapid injector via his right subclavian triple lumen central venous catheter. The extravasated contrast was deep to the pectoralis major muscle and anterior to the clavicle (Fig. 2). No contrast was visualized within the right pleural space or the venous system. The catheter tip, which was in proper position earlier, was noted to be extraluminal in the right subclavian region. A lump was noticed at the right anterior chest wall with no signs of skin discoloration. A right femoral triple lumen central venous catheter was placed emergently. After discussion with radiology and thoracic surgery, the patient was taken to the operating room for right chest exploration, evacuation and irrigation of contrast material and wound VAC™ placement.

Post-procedure radiographs revealed dissipation of contrast with no drainable collection. Magnetic resonance imaging (MRI) on post-operative day (POD)#1 revealed no evidence of residual collection in the region and no abnormal enhancement suggesting tissue necrosis. The wound VAC™ was changed on POD#2 with minimal inflammation of the surrounding tissue and no signs of tissue necrosis. The remainder of the patients hospital stay was complicated by ventilator dependency requiring tracheostomy, Clostridium difficile colitis, and right main pulmonary artery embolus despite prophylaxis. He was eventually discharged home after 6 weeks without any right anterior chest soft tissue infection, necrosis or brachial plexopathy.

3. Discussion

Subcutaneous extravasation of contrast material is a well-recognized complication occurring in 0.2–0.9% of patients receiving contrast media injection.[7,8,15,19,21] Frequency of extravasation is higher with mechanical bolus injectors than with hand-injection or drip infusion techniques.[8,15,19] No correlation has been made between frequency of extravasation with increasing injection rates.[10,16] No linear correlation is noted between extravasation rates with catheter size, type or location. Yet, in a large series of approximately 70,000 patients, the antecubital fossa was identified as the most frequent site of extravasation (44.8%). The shoulder was the site of extravasation in five adults (1.1%) and one pediatric patient.[21]

Those who are unable to communicate or respond to pain, such as infants or sedated patients, are more likely to develop extravasation injuries. Patients receiving chemotherapy have increased fragility of vein walls and increased risk of extravasation. Extravasation injury can be more severe in patients with arterial

* Corresponding author. Tel.: +1 302 733 4503; fax: +1 302 733 4513.
E-mail address: agaller@christianacare.org (A.S. Galler).
[1] Tel.: +1 610 447 2000; fax: +1 610 447 6110.

doi:10.1016/j.injury.2009.11.001

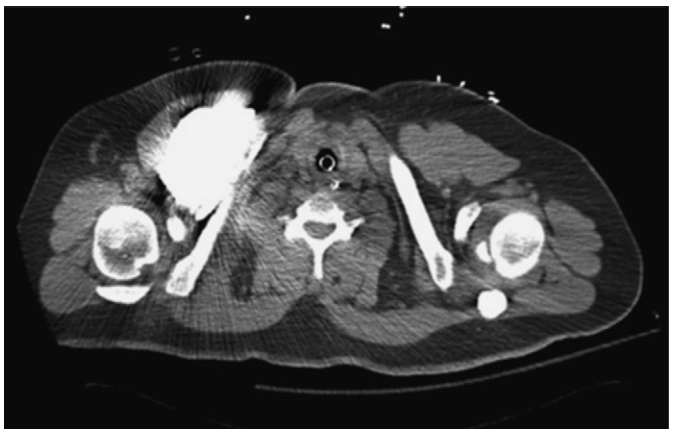

Fig. 1. Thoracic CT scan demonstrating contrast in the right peri-clavicular space measuring 5.9 × 10.6 × 11.2 centimeters (cm).

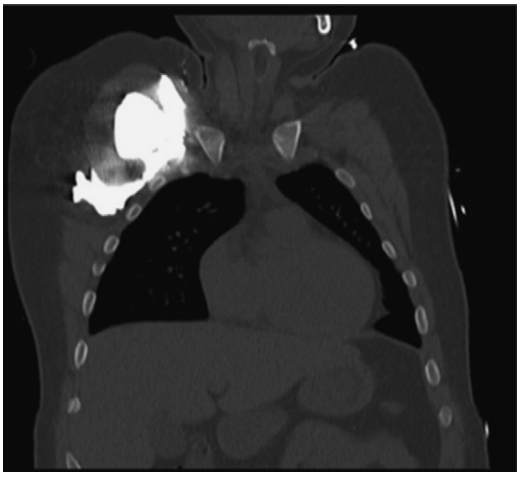

Fig. 2. Coronal thoracic CT scan identifying IV contrast anterior to the clavicle and deep to the pectoralis major muscle. Notice the lack of contrast within the right pleural space or the venous system.

insufficiency, venous thrombosis, or lymphatic drainage compromise due to loss of normal circulatory function.[2]

The vast majority of extravasations involve small amounts, which heal quickly.[4,8,19] Severe damage is usually a consequence of larger volumes (>50 mL) and commonly involved mechanical injectors.[2,15] Rarely, small amounts (10 mL) can cause skin necrosis and ulceration.[1]

The osmolality and cytotoxicity of contrast media is significant. Low-osmolar contrast media better tolerated than high osmolar media. (The threshold for injury is ~1.025–1.420 mOsm/kg water.)[19] High osmolar media is associated with increased incidence of necrosis, bleeding, and oedema evidenced in rat extravasation studies.[6] Studies have also shown that ionic contrast media is more toxic, causing an acute, then chronic inflammatory reaction with fibrosis and adjacent muscle atrophy detected at 8 weeks. This reaction peaks at 24–48 h after extravasation.[5,13]

The clinical presentation of extravasation is quite variable. Injury can range from minimal erythema and oedema to frank tissue necrosis and skin ulceration. Though rare, weakness, pain, and hypoesthesia have been reported as long term sequelae when not treated within an appropriate timeframe.[8] Compartment syndrome has been documented in several cases presenting as tense, dusky forearms with diminished pulses that require emergent fasciotomy.[2,3,17,21] Wang et al reported a brachial plexoplathy in a pediatric patient with extravasation into the axilla from an indwelling venous catheter.[21]

Most patients complain of a stinging or burning sensation, while some may have no symptoms at all. The site of extravasation will usually be tender with a red and swollen appearance. The majority of injuries will resolve spontaneously within 2–4 days, but this is difficult to predict based on initial exam.[2] Severely injured tissue will have skin blistering, altered tissue perfusion, paresthesia and increasing or persistent pain after 4 h.[4]

Local irritative or hypersensitivity reactions to contrast agents can be confused as extravasation injuries. Localized transient pain and delayed pain has been noted in up to 5% and 14%, respectively, in patients following intravenous administration of contrast material. Evaluation of the region will reveal the area to be tender, but without swelling or erythema. The catheter will also be appropriately situated within the vein.[14,18]

Extravasation of contrast can occur by several methods, but most commonly from dislodgement of catheters from their intravenous locations. As in our patient, the central venous catheter was accidently dislodged during transfer despite being secured to the skin. Proper methods of securing venous access is imperative in preventing extravasation, as well as attention to detail and care when transferring patients.

Several approaches of treatment exist for extravasation injuries, without a consensus for the best management. The approaches can be classified as either conservative or surgical. Most extravasation injuries will heal without surgery and therefore conservative therapy is often recommended. The affected limb should be elevated. Topical application of heat will cause vasodilatation, absorbing the contrast material. Cold application will produce vasoconstriction, limiting inflammation.[9]

Local subcutaneous injections of hyaluronidase have been recommended for patients with large volume extravasations. Hyaluronidase breaks down connective tissue and facilitates the absorption of the extravasated material.[11] It is well tolerated and often used for chemotherapeutic agent extravasations. Evidence for the treatment of contrast material is anecdotal with conflicting reports.[4,8,13]

Emergent suction is safe and effective in preventing severe effects of extravasation injuries. Loth and Jones recommended prompt surgical drainage and suction of extravasated contrast medium for any volume greater than 20 mL within 6 h.[12] Vandeweyer performed emergent liposuction with saline washout within 2 h for 11 patients with forearm extravasation injuries, noting complete healing in all patients.[20] The use of negative pressure dressings, including VAC™, for extravasation injuries is a new and useful tool.

Few studies have focused on extravasation of contrast material into the anterior chest wall. Wang et al noted a brachial plexopathy in a patient with a minimal amount of contrast extravasation into the axilla or anterior chest wall.[21] Due to the inability to conservatively treat extravasation in this region, we recommend early surgical drainage and saline washout in order to prevent long term damage. Still, the majority of injuries from extravasated contrast can be treated conservatively, with early surgical treatment for large volume extravasations.

References

1. Ayre-Smith G. Tissue necrosis following extravasation of contrast media. J Can Assoc Radiol 1982;33:104.
2. Bellin MF, Jakobsen JA, Tomassin I, Thomsen HS, Marcos SK, Thomasen HS, et al. Contrast medium extravasation injury: guidelines for prevention and management. Eur Radiol 2002;12(11):2807–12.
3. Benson LS, Sathy MJ, Port RB. Forearm compartment syndrome due to automated injection of computed tomography contrast material. J Orthop Trauma 1996;10(6):433–6.
4. Cohan RH, Ellis JH, Garner WL. Extravasation of radiographic contrast material: recognition, prevention, and treatment. Radiology 1996;200:593–604.

5. Cohan RH, Leder RA, Bolick D, Herzberg AJ, Hedlund LW, Wheeler CT, et al. Extravascular extravasation of radiographic contrast media: effects of conventional and low-osmolar contrast agents in the rat thigh. Invest Radiol 1990;25:504–10.
6. Cohan RH, Leder RA, Herzberg AJ, Hedlund AJ, Wheeler CT, Beam CA, et al. Extravascular toxicity of two magnetic resonance contrast agents: preliminary experience in the rat. Invest Radiol 1991;26:224–6.
7. Cohan RH, Bullard MA, Ellis JH, Jan SC, Francis IR, Garner WL, et al. Local reactions after injection of iodinated contrast material: detection, management, and outcome. Acad Radiol 1997;4(11):711–8.
8. Federle MP, Chang PJ, Confer S, Ozgun B. Frequency and effects of extravasation of ionic and nonionic CT contrast media during rapid bolus injection. Radiology 1998;206:637–40.
9. Hastings-Tolsma MT, Yucha CB, Tompkins J. Effect of warm and cold applications on the resolution of IV infiltations. Res Nurs Health 1993;16: 171–8.
10. Jacobs JE, Birnbaum BA, Langlotz CP. Contrast media reactions and extravasation: relationship to intravenous injection rate. Radiology 1989;209:411–6.
11. Laurie SW, Wilson KL, Kernahan DA, Bauer BS, Vustnes LM. Intravenous extravasation injuries: the effectiveness of hyaluronidase in their treatment. Ann Plast Surg 1984;13:191–4.
12. Loth TS, Jones DE. Extravasation of radiographic contrast material in the upper extremity. J Hand Surg Am 1988;13:395–8.
13. McAlister WH, Palmer K. The histologic effects of four commonly used contrast media for excretory urography and an attempt to modify the responses. Radiology 1971;99:511–6.
14. McCullough M, Davies P, Richardson R. A large trial of intravenous Conray 325 and Niopam 300 to assess immediate and delayed reactions. Br J Radiol 1989;62:260–5.
15. Miles SG, Rasmussen JF, Litwiller T, Osik A. Safe use of an intravenous power injector for CT: experience and protocol. Radiology 1990;176(1):69–70.
16. Memolo M, Dyer R, Zagoria RJ. Extravasation injury with nonionic contrast material. Am J Roentgenol 1993;160(1):203–4.
17. Selek H, Ozer H, Avgencel G, Turanli S. Compartment syndrome in the hand due to extravasation of contast material. Arch Orthop Trauma Surg 2007;127(6): 425–7.
18. Shedadi WH. Adverse reactions to intra-vascularly administered contrast media: a comprehensive study based on a prospective survey. Radiology 1975;124(1):145–52.
19. Sistrom CL, Gay SB, Peffley L. Extravasation of iopamidol and iohexol during contrast-enhanced CT: report of 28 cases. Radiology 1991;180(3):707–10.
20. Vandeweyer E, Heymans O, Deraemaecker R. Extravasation injuries and emergency suction as treatment. Plast Reconstr Surg 2000;105(1):109–10.
21. Wang CL, Cohan RH, Ellis JH, Adusumilli S, Dunick NR. Frequency, management, and outcome of extravasation of nonionic iodinated contrast medium in 69,657 intravenous injections. Radiology 2007;243(1):80–7.